CLAIMS:

1. A device for determining mechanical, particularly elastic, parameters of an examination object, comprising a) at least one arrangement for determining the spatial distribution of magnetic particles in at least one examination area of the examination object, comprising a means for generating a magnetic field with a spatial profile of the magnetic field strength such that there is produced in at least one examination area a first part-area having a low magnetic field strength and a second part-area having a higher magnetic field strength, a means for detecting signals which depend on the magnetization in the examination object, particularly in the examination area, that is influenced by a spatial change in the particles, and a means for evaluating the signals so as to obtain information about the, in particular temporally changing, spatial distribution of the magnetic particles in the examination area; and b) at least one means for generating mechanical displacements, in particular oscillations, at least in and/or adjacent to the examination area of the examination object.

2. A device as claimed in claim 1, characterized by at least one means, in particular at least one coil arrangement, for changing the spatial position of the two part-areas in the examination area so that the magnetization of the particles changes locally.

3. A device as claimed in claim 1 or 2, characterized in that the means for generating mechanical displacements or oscillations comprises at least one oscillating element, an oscillation generator and an oscillation transmission means for transmitting oscillations from the oscillation generator to the oscillating element and/or at least one sound source, in particular an ultrasound source.

4. A device as claimed in claim 3, characterized in that the oscillation generator is arranged outside and at a distance from the magnet arrangement and the oscillating element and the oscillation transmission means are made of non-metallic and/or metallic material.

5. A device as claimed in any of the preceding claims, characterized in that the means for generating the magnetic field comprise a gradient coil arrangement for generating a magnetic gradient field which in the first part-area of the examination area reverses its direction and has a zero crossing.

6. A device as claimed in any of the preceding claims, characterized by a means for generating a temporally changing magnetic field that is superposed on the magnetic gradient field, for the purpose of moving the two part-areas in the examination area.

7. A device as claimed in any of the preceding claims, characterized by a coil arrangement for receiving signals induced by the temporal change in the magnetization in the examination area.

8. A device as claimed in any of the preceding claims, characterized by means for generating a first and at least a second magnetic field that are superposed on the magnetic gradient field, where the first magnetic field changes slowly in time terms and with a high amplitude and the second magnetic field changes rapidly in time terms and with a low amplitude.

9. A device as claimed in claim 8, characterized in that the two magnetic fields run essentially perpendicular to one another in the examination area.

10. A method for determining mechanical and/or physical parameters of an examination object, in particular using a device as claimed in any of the preceding claims, comprising the introduction of magnetic particles into at least part of an examination area of the examination object, the generation of at least one mechanical displacement, in particular mechanical oscillations, in at least the examination area of the examination object, the generation of a magnetic field with a spatial profile of the magnetic field strength such that there is produced in the examination area a first part-area having a low magnetic field strength and a second part-area having a higher magnetic field strength, the changing of the spatial position of the two part-areas in the examination area so that the magnetization of the particles changes locally, the detection of signals which depend on the magnetization in the examination area that is influenced by this change, the evaluation of the signals so as to obtain information about the, in particular temporally changing, spatial distribution of the

magnetic particles in the examination area, and the comparison of the information obtained about the spatial distribution of the magnetic particles so as to determine elastic parameters, in particular of states of different mechanical stress.

11. A method as claimed in claim 10, characterized in that the magnetic particles in the examination area are present at and/or on the surface of gas bubbles and/or drops of liquid.

12. A method as claimed in claim 10 or 11, characterized in that the magnetic particles are monodomain and/or multidomain particles, the magnetization of which is reversed by means of Brown's rotation and/or Neel's rotation.

13. A method as claimed in claims 10 to 12, characterized in that a temporally changing magnetic field acts on the examination area in a first frequency band and, from the signal received in the coil, a second frequency band which preferably contains higher frequency components than the first frequency band is evaluated so as to obtain information about the spatial distribution of the magnetic particles.

14. A method as claimed in any of claims 10 to 13, characterized in that as mechanical or physical parameters there are determined, in particular locally, the internal pressure, the change in internal pressure, the volume and/or the change in volume of gas bubbles present in the examination area of the examination object.

15. A method as claimed in any of claims 10 to 14, characterized in that as mechanical or physical parameters there are determined, in particular locally, the temperature, the change in temperature, the rigidity, the change in rigidity, the density and/or the change in density, the pressure, the displacement, the modulus of elasticity and/or the shear modulus in the examination area.

16. A method as claimed in any of claims 10 to 15, characterized in that the mechanical or physical parameters are detected continuously or at intervals.

17. A method as claimed in any of claims 10 to 16, characterized in that the magnetic particles are present in or are introduced into the examination area in a homogeneously or inhomogeneously distributed manner.

18. A method as claimed in any of claims 10 to 17, characterized in that the examination area is additionally subjected to an, in particular periodic, fluctuation in pressure for the purpose of calibration.

19. The use of the device as claimed in any of claims 1 to 9 for determining the internal pressure or the change in internal pressure of gas bubbles present in an examination object, in order to image body parts and/or organs.

20. The use of the device as claimed in any of claims 1 to 9 for examining, particularly in real time, rubber components, tires or components based on thermoplastic elastomers, or tissue or organs, in particular respiratory organs.

21. Magnetic gas bubble composition, comprising one or more gas bubbles in a liquid medium wherein magnetic particles are present at the interface of the gas bubble and the liquid medium.

22. Magnetic gas bubble composition according to claim 21, further comprising a surfactant for localising the magnetic particles substantially at the interface between the gas bubble and the liquid medium.

23. Magnetic gas bubble composition according to claim 22 , wherein the magnetic particles are attached to a surfactant molecule.

24. Magnetic gas bubble composition according to claims 21 to 23 , wherein the diameter of the gas bubble is between one and 10 μmeters.

25. Magnetic gas bubble composition according to claims 21 to 24, wherein the bubble comprises a drug.

26. Magnetic gas bubble composition according to any one of claims 21 to 25, wherein the gas has a low water solubility, in particular wherein the gas does not substantially dissolve and/or does not rapidly dissolve in water, preferably a perfluorated gas.

27. Magnetic gas bubble composition according to any one of claims 21 to 26, wherein the average particle to particle distance between the magnetic particles at the interface between the gas bubble and the liquid medium is less than 10 times the magnetic particle size.

28. Magnetic gas bubble composition according to any one of claims 21 to 27 , wherein the magnetic particles are monodomain particles having an anisotropy.

29. Magnetic gas bubble precursor for the manufacture of a magnetic gas bubble composition according to any one of claims 1 to 28 , wherein the gas bubble precursor comprises a shell encompassing a gas volume and wherein the shell comprises magnetic particles.

30. Magnetic gas bubble precursor according to claim 29 , wherein the shell comprises a material that dissolves or reduces viscosity in contact with a liquid medium such that the magnetic particles gain freedom for rotational movement when dispersed in the liquid medium.

31. Elastic magnetic particle composition comprising elastic particles comprising two or more magnetic particles in an elastic medium wherein the average distance between the magnetic particles is between 3 and 10 times the average magnetic particle diameter.

32. Use of a magnetic gas bubble composition according to any one of claims 21 to 28 or a magnetic gas bubble precursor according to claims 29 or 30 or an elastic magnetic particle composition according to claim 31 as an imaging agent in a magnetic particle imaging technique, in particular for imaging pressure in an examination area by said technique, more particular for imaging elastic properties of the examination area by acoustic waves.

33. Magnetic particle composition having a magnetization curve having a step change, the step change being characterized in that the magnetization change, as measured in an aqueous suspension, in a first field strength window of magnitude delta around the inflection point of said step change is at least a factor 3 higher than the magnetization change in the field strength windows of magnitude delta below or in the field strength windows of magnitude delta above the first field strength window, wherein delta is less than 2000 microtesla and wherein the time in which the magnetisation step change is completed in the first delta window is less than 0.01 seconds.

34. Use of a magnetic particle composition according to claim 39 in any one of claims 1 to 32.